CLAIMS

WHAT IS CLAIMED IS:

1   1. A planar lightwave circuit comprising:

2   a first portion of a waveguide;

3   a second portion of waveguide; and

4   a segment of crystal core fiber coupling the first portion of the waveguide

5   with the second portion of the waveguide.

1   2. The planar lightwave circuit of claim 1 further comprising:

2   an optical index-matching gel disposed between the segment of crystal core

3   fiber and the first portion and second portion of the waveguide.

1   3. The planar lightwave circuit of claim 1, wherein the segment of crystal core

2   fiber has a principal optical axis disposed at approximately a 45-degree angle with the

3   planar lightwave circuit.

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1   4. The planar lightwave circuit of claim 1, wherein the planar lightwave circuit is

2   an array waveguide grating.

1   5. The planar lightwave circuit of claim 4, wherein the segment of crystal core

2   fiber is disposed at a mid section of the array waveguide grating.

1   6. The planar lightwave circuit of claim 5, wherein the segment of crystal core

2   fiber is disposed in a V-groove substrate.

1   7. The planar lightwave circuit of claim 4, wherein the segment of crystal core

2   fiber has a length that satisfies the equation $(2m+1) * \lambda / (2 * \Delta n)$, wherein m is any non-

3   negative integer, λ is a wavelength of an optical signal in an optical communication

4   waveband range, and Δn is a measure of birefringence of the segment of crystal core

5   fiber.

1   8. The planar lightwave circuit of claim 7, wherein the optical communication

2   waveband range is approximately 800 nm to 1700 nm.

1   9. The planar lightwave circuit of claim 7, wherein the segment of crystal core

2   fiber comprises quartz, lithium niobate, lithium borate, beta-barium borate or other

3   inorganic substance.

1   10. The planar lightwave circuit of claim 7, wherein the segment of crystal core

2   fiber comprises an organic or polymeric substance.

1   11. An array waveguide grating comprising:

2   a plurality of waveguides;

3 a V-groove portion of substrate having multiple segments of crystal core

4   fibers inserted into a section of the plurality of waveguides.

1 12. The array waveguide grating of claim 11 further comprising:

2   an optical index-matching gel disposed at ends of the multiple segments of

3   crystal core fibers.

1 13. The array waveguide grating of claim 11, wherein the V-groove portion of

2 substrate is inserted at a midway point of the array waveguide grating.

1 14. A method of correcting for birefringence in a planar lightwave circuit, the

2 method comprising:

3   removing a section of the planar lightwave circuit; and

4   inserting a portion of crystal core fiber into the planar lightwave circuit.

1 15. The method of claim 14, wherein inserting the portion of crystal core fiber

2 further comprises:

3   positioning the portion of crystal core fiber to have approximately a 45-

4   degree angle between an optical axis of the portion of crystal core fiber

5   and a substrate plane of the planar lightwave circuit.

1 16. The method of claim 15 further comprising:

2   inserting an index-matched gel between the portion of crystal core fiber and

3   the planar lightwave circuit.

1   17. The method of claim 14, wherein the portion of crystal core fiber is disposed

2   in a V-groove substrate.

1   18. The method of claim 17, wherein other portions of crystal core fiber are also

2   disposed in the V-groove substrate.

1   19. A method of correcting for birefringence in a planar waveguide, the method

2   comprising:

3   directing an optical signal down a first segment of the planar waveguide;

4   changing a polarization of the optical signal by directing the optical signal

5   through a portion of crystal core fiber; and

6   directing the optical signal down a second segment of the planar waveguide.

1   20. The method of claim 19 further comprising:

2   reducing loss of the optical signal between an interface of the portion of

3   crystal core fiber and the planar waveguide by using an index-matched

4   gel.

1   21. The method of claim 19, wherein the length of the portion of crystal core fiber

2   satisfies the equation $(2m+1) * \lambda / (2 * \Delta n)$, wherein m is a non-negative integer, λ is a

3   wavelength of the optical signal, and Δn is a measure of birefringence of the portion of

4   crystal core fiber.

1   22. The method of claim 21, wherein λ is in an optical waveband range of

2   approximately 800 nm to 1700 nm.